Journal of the Society of Arts.

FRIDAY, DECEMBER 22, 1865.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'clock:—

January 17.—"On Automatic Telegraphy." By Alexander Bain, Esq.

January 24.—"On the Uses of National Museums to Local Institutions." By Lord Henry G. Lennox, M.P.

Cantor Lectures.

The concluding Lectures of the Course by G. W. Hastings, Esq., LL.D., will be delivered as follows:—

Lecture III.—Monday, January 15th.—"On Copyright and Trade Marks."

Lecture IV.—Monday, January 22nd.—"On Limited Liability."

The lectures commence each evening at Eight o'clock, and are open to Members, each of whom has the privilege of introducing one Friend to each Lecture.

The tickets already issued will be available on these evenings.

International Horticultural Exhibition, 1866.

In connection with this undertaking, the Council have decided to offer a sum of £50 in prizes for Implements, &c., of which particulars will be found at page 86.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Sixth Ordinary Meeting.

Wednesday, December 20th, 1865; William Hawes, Esq., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Caunter, Henry, Stornoway, Isle of Lewis, N.B.
Dawson, G. J. Crosbie, C.E., Engineers' Office, Euston Station, N.W., and 7, Queen's-square, St. James's-park, S.W.
Emerson, William, 79, Hamilton-terrace, St. John's-wood, N.W.
Flux, Wm., 1, East India-avenue, Leadenhall-street, E.C.
Gardner, Hannibal, 19, Took's-court, Chancery-lane, E.C.
Garland, Charles, 28, Billiter-street, E.C.
Harvey, Richard Musgrave, 45, Portland-place, W.
Hughes, Walter, Southwood-house, Highgate, N.
Jones, Henry, 55, St. Paul's Churchyard, E.C.
Nutter, George, 167, Richmond-road, Hackney, N.E.
Parkes, Alexander, Warwick-place, Coventry-road, Birmingham.
Ravenscroft, Edward, 14, Preston-terrace, Edinburgh.
Spill, Daniel, Hackney-wick, N.E.
Towsey, William, 19, Bunhill-row, E.C.
Vaile, Samuel, 22, Basinghall-street, E.C.
Ware, Martin, jun., 25, Old-square, Lincoln's-inn, W.C.
Wilson, William, 4, Victoria-street, Westminster-abbey, S.W.

The following candidates were balloted for, and duly elected members of the Society:—

Ashbury, John, 27, Great George-street, Westminster, S.W.
Bikélas, D., 19, Old Broad-street, E.C.
Blackburn, James, Droylsden. Manchester.
Booth, J. P., Bellevue-house, Cork.
Cursetjee, Manackjee, Hill-house, Southampton.
Ellis, Edward, 9, Fenchurch-street, E.C.
Hindley, D. P., 10, Old Jewry-chambers, E.C.
Laycock, William E., Portobello-place, Sheffield.
Maxwell, Nicholas M., 4, Allhallows-chambers, Lombard-street, E.C.
Nash, Arthur Briscoe, 25, Cornhill, E.C.
Nixon, Joseph, 104, Fore-street, E.C.
Palmer, George Harry, 2, Middle Temple-lane, E.C.
Robinson, A. A., 137, Fenchurch-street, E.C.

The Paper read was—

ON THE PROPERTIES OF PARKESINE, AND ITS APPLICATION TO THE ARTS AND MANUFACTURES.

By Alex. Parkes, Esq., of Birmingham.

In introducing to this meeting the subject of Parkesine, the author wishes to explain the reasons that led him to the production of this substance.

For more than twenty years the author entertained the idea that a new material might be introduced into the arts and manufactures, and in fact was much required; he succeeded in producing a substance partaking in a large degree of the properties of ivory, tortoise-shell, horn, hard wood, india rubber, gutta percha, &c., and which will, he believes, to a considerable extent, replace such materials, being capable of being worked with the same facility as metals and wood. This material was first introduced, under the name of parkesine (so called after its inventor), in the Exhibition of 1862, in its rough state, and manufactured into a variety of articles in general use; it then excited the greatest attention, and received a prize medal, Class IV., 1112.

Parkesine is made from pyroxyline and oil, alone or in combination with other substances; the various degrees of hardness or flexibility are obtained in the easiest and most expeditious manner by varying the proportions of pyroxyline, oil, and other ingredients.

The pyroxyline used as the base in the manufacture can be made from any vegetable fibre, or fibre-producing grasses, starch, &c., but preferably of waste from cotton and flax mills, old rags, paper makers' half-stuff, or any fibrous waste material capable of being reduced into a soluble condition by the action of acids. To subdue the inflammable nature of this compound, the inventor has introduced several substances such as iodide of cadmium, tungstate of soda, gelatine, chloride of zinc, several carbonates, sulphates, phosphates, and other substances.

The oils employed are some of the vegetable and some of the animal kingdom; they may be used alone or combined, either in their normal condition, or changed by a solidifying agent, chloride of sulphur being preferred, which has the remarkable property of completely

solidifying the oils almost instantaneously; but the chemical combination can be modified according to the per-centages of the chloride of sulphur employed, which may be varied to meet the exigencies of commerce. These solidified oils, although unchanged by ordinary re-agents, are readily soluble in the author's solvents of pyroxyline, by which means the two ingredients are combined to form one of the descriptions of parkesine.

The inventor, after much research, labour, and investigation, observed that the solid residue left on the evaporation of the solvent of photographic collodion produced a hard, horny, elastic, and waterproof substance. This led him to employ, in all his experiments, pyroxyline, xylodin, or some collateral matter, as his base for future operations. By the word pyroxyline the author wishes to be understood a less explosive preparation than the more highly converted compound "gun cotton," and his constant aim has been to apply to peaceful industrial purposes a material hitherto only used for military, blasting, and photographic purposes. The solutions of collodion known at the time of his first patent, in October, 1855, were practically unsuited to carry out the manufacture in solid masses and other large forms. This necessitated a new series of experiments, to discover a more economical mode of production, and he found that, by improving the manufacture of pyroxyline, and using different solvents, considerable success was attained; as an illustration to show the impracticability of using collodion for the manufacture of solid articles, we have here a bottle of ordinary collodion, which is submitted to your notice. This is a solution of pyroxyline in the well-known solvents, ether and alcohol, and when you are told that, in one pint of these mixed solvents there is only one-third of an ounce of solid material, and the whole of this pint of solvents must be evaporated to obtain this small quantity of hard substance, you will readily conceive that the cost of production would be much too high for large commercial purposes. The cost of one pound of the mixed solvents would be 2s. 6d., the pyroxyline being 10s. per lb., and as one pound of pyroxyline will require 48 pounds of solvent to make photographic collodion, there will be a total cost of 130s. per lb. for the solid material which could be obtained from the evaporation of such solvents. This small specimen of pyroxyline now exhibited is the exact weight of that contained in the bottle, whereas, by employing the same quantity of the author's patented solvents, this large bulk of unconverted cotton, which, for the sake of safety, represents a similar bulk of pyroxyline, can be dissolved sufficiently for the manufacture of parkesine.

The author commenced his investigations in face of the above-named difficulties, and endeavoured, by more economical methods of manufacturing the pyroxyline or other similar compounds, and by the use of improved and less costly solvents, to produce a new and cheap material; this, after many years of labour and thousands of experimental trials, he has succeeded in doing, and at the present time almost any quantity may be made per day (many tons—simply depending upon the apparatus), at a cost of less than 1s. per lb. and upwards, according to the quality required.

The two specimens shown illustrate the great difference between the two productions. The small piece is made from the collodion of commerce, at a cost of 130s. per lb.; and the sheet is the result of that made from the present mode of manufacture, at a cost of less than 1s. per lb. This will at once establish in your minds the practical value of the invention.

Having then satisfied himself as to the possibility of producing the material at such a price as would allow of its application in the arts, his next step was, by the combination of various substances, to counteract the inflammability of the material—to produce various colours —and to modify its hardness, toughness, and elasticity; and although from the above statements the object sought to be obtained may appear exceedingly simple, it nevertheless necessitated an enormous amount of application to arrive at the knowledge which has enabled him to produce the specimens which are now laid before you.

One of the greatest difficulties in the earlier stage of his experiments was caused by the excessive contractile properties of the dissolved pyroxyline, as the piece now produced, as compared with the comparatively large bottle, will clearly exemplify, being the whole of the solid residue contained in thirty-five cubic inches of collodion; in fact, if a stiff solution of pyroxyline were made, such as would not flow from a bottle, still such a preparation would contract to from ten to fifteen times its volume, whilst in the present workings only from one-fourth to one-fifth of a pound of solvent is used to one pound of pyroxyline; consequently the contraction is reduced in proportion to the solvents used.

The author had long to contend against the adverse opinions of many, that his efforts to introduce such an article for the general purposes of manufacture, from such expensive materials, appeared hopeless; and even since specimens were shown at the Exhibition of 1862 much discouragement has been thrown in the way of the progress of the invention, by many who had conceived the idea that it would be impossible to produce the material at a price that would render it valuable for general application; the inventor feels proud that he has been enabled to surmount these obstacles in so far establishing a new manufacture which—by the intelligence of practical minds, which he trusts will be devoted to its further development—will, he ventures to hope, eventually become one of considerable commercial importance.

The innumerable trials and investigations required, involved no less than twelve years' labour and an expenditure of many thousand pounds, before the material could be proved to be really of commercial importance; and although this may appear a long time to pursue one object, the author wishes to explain that time has been itself of the utmost importance in developing this manufacture, as it has enabled him to test the effect of time on the material, and also of atmospheric changes, and many other influences; this has proved of great value in arriving at his present knowledge of the material. Although he has been much engaged in other important business he was determined not to relinquish the manufacture of parkesine until the truth of what he stated at the Exhibition, in 1862—that the material could be produced in some of its qualities at 1s. per lb., was proved—and this he has satisfactorily established by twelve months' practical working. One of the means which enable him to produce parkesine at a cheap rate, is the employment of waste cotton, in the shape of rags or otherwise, which are procurable at an exceedingly low price, and also the use of improved solvents, and the means of recovering them by special machinery; also the being able to dissolve the pyroxyline in a wet state, thus avoiding the time and great space and risk of drying, which was the practice until recent important improvements enabled him to accomplish this most important desideratum.

When it is necessary or desirable to increase the flexibility or elasticity of preparations of pyroxyline, the author combines therewith oils, solidified or partly solidified by the action of chloride of sulphur, a reaction discovered by him some twenty years ago, when engaged in investigations relative to the cold process of vulcanizing India rubber, patented by him about that time. The chloride of sulphur is dissolved in bisulphide of carbon or mineral naphtha, the proportion suitable for the purpose being from 10 to 15 per cent. of chloride of sulphur to the cotton seed, castor, or other oils. This will be found (as will be exhibited to you by experiment) to be of a solid or a semi-solid consistence, according as more or less of the chloride of sulphur is used, so that the physical condition of preparations of pyroxyline may be considerably modified to suit special applications by the

use of gums, resins, paraffin, stearine, tar, glycerine and other substances combined therewith.

The author would observe that the result of using a large proportion of the chloride of sulphur is to solidify the oil (even to a jet-like mass), but it is preferable to use about 15 per cent. to produce a tough, elastic substance. He wishes it to be observed, generally, that in proportion as the oils predominate, so is the elasticity of the materials regulated.

Another important improvement in the manufacture of parkesine is the employment of camphor, which exercises an advantageous influence on the dissolved pyroxyline, and renders it possible to make sheets, &c., with greater facility and more uniform texture, as it controls the contractile properties of the dissolved pyroxyline; camphor is used in varying proportions according to requirement, from 2 per cent. to 20 per cent. Another of the author's improvements for the like object consists in the use of gelatine dissolved in glacial acetic acid.

The author believes he was the first to employ colours in the dissolved pyroxyline. The solvents used in the manufacture of parkesine are also good solvents of the aniline colours; this gives the great advantage of producing the most beautiful colours in a transparent substance, as well as in opaque or solid masses, as the specimens will show; and when these coloured articles are carved the most exquisite effects are produced, imitating amber, malachite, and many other natural substances; moreover, as the material can be moulded by pressure, the most beautiful works of art can be copied at a very small cost. For many large and cheap applications, as much as 60 per cent. of pigments, saw-dust or cork-dust, can be introduced with advantage, and thus is produced a beautiful and solid substance, very strong, which can be moulded and turned in a lathe or rolled into sheets, the cost, owing to these admixtures, being exceedingly low.

In all large manufactures the most important point to be considered is the production of raw material, which in many cases fails in quality and supply. The substances the author employs in the manufacture of parkesine are procurable in any quantity, and having a perfect control in the manipulation of the materials used, he can always ensure a regularity in the various qualities required, thus placing at the command of the artisan a material to be had at all times of a uniform standard quality, which he conceives to be no slight boon to the manufacturer.

There is another important feature in the economy of this material; no loss in manufacture is experienced, every particle, scrap, or dust can be reworked, and the most beautiful effect produced. Specimens will show the effect of some of the waste scraps re-manufactured, and it will be readily seen that by careful admixture of colours very pleasing results may be obtained. This is an important advantage over other materials, such as ivory, tortoise-shell, india-rubber, vulcanite, gutta-percha, &c., with which this substance is calculated to compete.

The difficulties in manufacturing this material on a commercial scale were at first very great, as before explained, but by steadily persevering, the manufacture is now rendered very simple and rapid. From five to ten tons of parkesine sheets can now be produced in less time than one ton of India rubber. Sheets of large size and of any thickness, solid blocks, tubing, or other forms, can be made in a few minutes, and from the cheapness and unlimited supply of the raw materials employed, the price of parkesine will, it is believed, be much less than that of india-rubber, ebonite, gutta-percha, ivory, tortoise-shell, and many other materials.

Many specimens on the table have been produced from materials made ten years ago, in which no change or decomposition has taken place; the substance is not affected by sea-water, in which it has been immersed for a period of four years without the least deterioration, nor is it softened by heat-like gutta-percha, and, therefore, it is not likely to be affected by the heat of tropical climates.

It can be made transparent, or in any colours, variegated to imitate tortoiseshell, marble, malachite, hard or flexible; can be moulded, shaped, by dies or pressure, turned in a lathe, worked into screws, cut with a saw, planed, carved, engraved, rolled or pressed into sheets, as all the articles in the case before you will clearly show; it is very agreeable to the touch, and is susceptible of the highest polish; it can be inlaid with metals without any injurious effect upon them after years of exposure; it is also invaluable as a waterproofing agent, and can be used as a varnish for a variety of purposes, and as a non-oxidising agent for the protection of iron ships, &c.

The various stages of manufacture are fully illustrated by the variety of specimens now before you, from the unprepared cotton waste to the ultimate conversion into the finished articles.

Perhaps one of the most interesting facts in connection with this new manufacture is the employment of nitro-benzole, or aniline, by which improvement very great facilities are obtained in dissolving pyroxyline, and as these materials are also solvents of india rubber and gutta percha, a combination of these substances may be readily obtained which will be valuable for many purposes. A specimen of this combination is on the table.

The applications of this material to manufactures appear almost unlimited, for it will be available for spinners' rolls and bosses, for pressing rolls in dyeing and printing works, embossing rolls, knife handles, combs, brush backs, shoe soles, floor-cloth, whips, walking sticks, umbrella and parasol handles, buttons, brooches, buckles, pierced and inlaid work, book-binding, tubes, chemical taps and pipes, photographic baths, battery cells, philosophical instruments, waterproof fabrics, sheets, and other articles for surgical purposes, and for works of art in general.

There is one application of the parkesine which, as far as experiments have gone, promises to be of great importance, viz., insulating telegraph wires. It will be at once evident, from the nature of the ingredients used, that by simple mechanical and chemical processes, perfect freedom from impurities or foreign ingredients can be attained; a most important property in a material which it is intended to employ for electrical and insulating purposes. The difficulty of producing a pure and homogeneous article, has, there is reason to believe, resulted in the total failure of some thousands of miles of submarine cables and underground wires. Parkesine is placed upon the wire by being forced through a die in successive coatings with the same facility as gutta-percha, and the author believes it to be far less liable to faults than india-rubber.

A few specimens of the application of the material for electrical and telegraphic purposes are exhibited. It is, however, deemed advisable to state, that extensive experiments have been made under the direction of Mr. Owen Rowland (Electrician to the late Joint Committee of the Board of Trade and the Atlantic Telegraph Company, appointed to inquire into the construction of submarine telegraph cables, &c.), with a view of ascertaining to the fullest extent the electrical properties and applicability of the material for the above important purposes. The results of those experiments leave no reason to doubt that, on the completion of the necessary machinery, a most excellent and efficient insulator will be produced (and indeed it has already been produced, even by imperfect and inadequate machinery), possessing all the requirements of insulation.

Short specimens of insulated wire (made by hand) in this substance for underground and aerial lines are exhibited, the latter in the form of a multiple cable, according to the valuable patent of Professor Wheatstone, containing an insulated sustaining iron wire, and 79 insulated conducting copper wires, both insulation and protecting envelope being effected by

parkesine, which, possessing great strength and flexibility, and being a non-oxidising material, is extremely well adapted for the latter purpose. This cable is believed to be capable of bearing its own weight in air for a distance of upwards of one mile.

In its hard and solid form, by virtue of its high insulating and non-oxidising properties, this material is peculiarly well adapted for electrical instruments, terminal boards, testing boxes, batteries, insulators for poles, and many other philosophical purposes, and the advantages to be derived from the employment of a material which remains free from oxidation under all conditions, will be duly appreciated by electricians and experimentalists in their daily operations amd investigations. Its tensile strength is considerably above that of either gutta percha, india rubber, or any other insulating material. Joints can be made with the greatest facility and perfection.

In the following experiments on the insulating power of parkesine as compared with various other materials, the greatest care was taken to secure a correct and reliable result. The temperature was constantly maintained at 61°; the pieces were thoroughly dried, to avoid surface conduction; the same surface length of each made to rest on the metallic stand in contact with earth; the blotting paper between the *piece* and the metal kept saturated with water, so as to insure complete surface contact; the leakage of the instrument itself frequently ascertained; the full tension at the commencement of each test recorded as well as the exact time. The tests in some instances were repeated several times with uniform results.

Experiments made at Hackney Wick, on the 29th August, 1865, on the loss of insulation on lengths of variously coated copper wires, &c.; instrument employed, a Peltier electrometer. Full tension, 40; temperature, 61° Fahr.

Parkesine	5 deg. in	1′ 45″
Plain gutta-percha	,,	0 37
Gutta-percha and Chatterton's compound	,,	1 8
Plain gutta-percha covered with parkesine	,,	1 4
India-rubber (masticated)	,,	1 15
India-rubber (virgin)	,,	0 30
Ebonite disc	,,	2 10
Parkesine disc	,,	2 35

The author has been furnished by Mr. Owen Rowland with the result of a further series of experiments made recently by him on the insulating properties of the material. These tests were made upon slabs and sheets of various qualities, hardness, and flexibility. Specimens are exhibited.

The value of the insulating properties of each piece in comparison with ebonite is shown in the following table:—

	Leakage.		Time.
No. 1 specimen ..	11.5 deg.	in	1,080 seconds.
,, 2 ,, ...	11.5 ,,	in	510 ,,
,, 3 ,, ...	11.5 ,,	in	180 ,,
,, 4 ,, ...	11.5 ,,	in	360 ,,
,, 5 ,, ...	11.5 ,,	in	210 ,,
,, 6 ,, ...	11.5 ,,	in	185 ,,
,, 7 ,, ...	11.5 ,,	in	212 ,,
,, 8 ,, ...	11.5 ,,	in	509 ,,
,, 9 ,, ...	11.5 ,,	in	25 ,,
,, 10 ,, ...	11.5 ,,	in	2,046 ,,
,, 11 Prepared Oil or base of Parkesine	11.5 ,,	in	1,930 ,,
,, 12 ebonite ..	11.5 ,,	in	1,050 ,,

The third column shows the time occupied by the needle of the electrometer in falling from the maximum tension of the electric charge to one-half tension thereof, or from 50 deg. to 38·5 deg.

It is satisfactorily proved that the more perfect the means adopted for rendering the material free from impurities, the more its efficiency for insulating purposes increases.

DISCUSSION.

In reply to inquiries by Admiral Sir EDWARD BELCHER, it was stated by Mr. Parkes that the solvent employed in this process was naphtha—either vegetable or mineral; that the present price of parkesine ranged from 1s. per lb. upwards, according to quality; that its specific gravity was about equal to that of gutta percha; that no experiments had yet been made with regard to the resistance of this material to cannon.

Sir EDWARD BELCHER thought it was likely to be very valuable for the filling in of the intervals between the plates and the backing in iron ships of war instead of teak. He thought it would afford greater resistance to shot, and there would be no splinters. He wished to know whether it was inflammable.

Mr. PARKES replied that it could be made almost uninflammable; and moreover, when used in contact with iron, it had no tendency to produce oxydation. With proper machinery a ton weight of the material would be produced in half-an-hour. As a varnish [a specimen of which was exhibited] it could readily be applied to the bottoms of iron ships to prevent corrosion from sea-water. Experiments were being carried on with regard to its imperviousness to the attacks of marine insects, but the results had not yet been ascertained.

Mr. OWEN ROWLAND said, having been for some time engaged in making experiments upon this material, with a view to its application to telegraphic purposes, he thought it would be interesting to hear the results of those experiments. He had watched with great interest the progress of this invention for the last three years, and, like all great inventions, it had had a great deal to contend against, because it was very likely to displace many articles which were now very much in popular favour and use. He had kept several specimens of various materials (this one amongst the number) exposed to atmospheric influences, under different conditions, during the time he was engaged on the part of the Board of Trade in testing different insulating substances. He found that atmospheric exposure had not the least effect upon this material. It was not rendered less elastic, and its toughness was not diminished, nor was there the least approximation to decomposition. In that respect he believed it would be most valuable from its non-oxydizing properties. In regard to its application to telegraphic purposes he was sure they would all say they could not but wish to see a material introduced which would extend the great advantages which the telegraph was calculated to confer upon society. There was room for many materials for this purpose, and he was sure telegraphy had suffered immensely from the doubts existing in men's minds as to the sufficiency of the insulators now generally employed. The battle of the insulators in telegraphy had rivalled that of the gauges in the earlier days of railroads. For a considerable time past the efforts made to furnish a new insulating material had been very great; from day to day combinations were produced, which he had submitted to the test of the particular form of electrometer he had before him (Peltier's), which was unerring. The results of his tests of the substance now under consideration led him to think that in this material they would eventually have an excellent, cheap, and efficient insulator. On the paper placed on the board at the back of the chair he had arranged specimens of the material of different qualities, and he had tested the insulating powers of each specimen. The instrument employed in the testing was charged to a tension of 50, representing 512 cells of Daniel's battery. He placed this instrument in contact with the insulating material, and then watched the fall of the needle. If the needle fell so much in a minute with one article and

fell more with another, then the former was the superior insulator. The results of these experiments were given in the table at the end of the paper. He did not agree with the plan of testing cables which had hitherto been pursued; he believed it had not been half severe enough. He had tested some hundreds of miles of the Atlantic cable, and he considered the test was not stringent enough. Sufficient attention had not been paid to the temperature and dryness of the atmosphere. In making his (Mr. Rowland's) experiments, the room in which the testing was to be carried on was kept at a temperature of 61 deg. to 65 deg., and the hygrometric state of the atmosphere carefully ascertained. The first attempt with material No. 9 (in the table) showed a leakage, that was, the needle of the instrument fell down 11·5 deg. in 25 seconds; with No. 3 it fell down the same amount in 180 seconds; with No. 2 in 510 seconds; with No. 1 in 1,080 seconds; with No. 8 in 509 seconds, and this was an excellent insulator; with No. 10 in 2,046 seconds, and so on with the rest, while ebonite took 1,050 seconds. Ebonite, which had been very much used, had been generally regarded as a very excellent article for these purposes, but he considered it had been surpassed by this invention. No proper machinery had as yet been constructed for the production of this article as it was intended to be ultimately manufactured. It required the utmost cleanliness and purity in its manipulation when intended for insulating purposes. Those were important considerations in all electrical matters, and having witnessed the manufacture of several telegraphic cables, he was pleased to see that this material, even though as yet imperfectly manufactured promised so well as an insulator. He remembered that in the first manufacture of gutta-percha considerable impurities existed, and in many cases a really good insulating material had been condemned entirely through the foreign matters which it contained. He had a very strong opinion of the durability of this material. He saw no change in it, in whatever conditions he had placed it. He had boiled it in water; had exposed it to a hot sun; and had tested it in conditions to which it would never be exposed when used for electrical purposes, and he found little or no effect produced upon it. What was required for the perfecting of the invention was machinery into which no impurities could enter. He was very glad to find this invention brought before the Society of Arts, as had been done in the case of some of the greatest inventions ever produced. Twenty-one years ago he assisted Mr. Fothergill Cooke in exhibiting an electric telegraph in this room, which on its first introduction to the world had a great deal to contend against. He confidently expected to see this new material taking its place in the great and important work of extending electric telegraphy.

Mr. WILSON inquired the means by which this material could be joined together?

Mr. PARKES replied it was joined by means of its own solvent, and became a homogeneous mass.

Mr. BENJAMIN FOTHERGILL asked whether, in the event of this material being employed on iron for rollers, there was any danger of its becoming disunited from the iron?

Mr. PARKES replied, that from its elastic and cohesive property and contractile force he could not imagine that it would separate from the iron.

Mr. TAYLOR remarked that as the inductive capacity of materials employed in telegraphy was a point of great importance, he should be glad to hear whether this material exhibited any advantages in that respect.

Mr. ROWLAND replied that the figures he had given might be said to represent the inductive capacity of the material. He believed it to be about equal to india-rubber in that respect.

Dr. BACHHOFFNER said the variety of applications to which this material seemed to be adapted rendered it one of considerable interest and importance. As to its applicability to telegraphic purposes, practical trial alone could decide the question. The conclusions arrived at by Mr. Rowland, as the result of his experiments, were entitled to weight, but he believed it was a question whether that perfect insulation spoken of was the best condition for an electrical cable; however that might be, there could be no doubt that in this invention a very important addition had been made to our manufacturing resources, and he hoped his friend in the chair would not object to the inventor enjoying the benefits of a patent for it. It was always the privilege of an Englishman to grumble, and he claimed that privilege on the present occasion, inasmuch as having seen the announcement that "parkesine" was to be the subject of discussion this evening, he consulted every book in his possession in the endeavour to ascertain what parkesine was, but he failed in obtaining the information. He begged to raise his protest against inventions of this kind being called after the name of the inventor, for though, doubtless, this name would be handed down in connection with the material, yet, as there were a great number of Parkes's, many of that name might unjustly arrogate to themselves the merit of this invention. It was, however, often the case that great discoveries were associated with the patronymic of the inventor or discoverer, as in the cases of Galvani and Volta in connection with galvanic or voltaic electricity, and MacAdam, the inventor of the modern system of roads; but he thought, from the multiplicity of purposes to which this material was adopted, it would be well to give it a name which would convey a better idea of what it was than could be gained by the public generally under its present title.

The CHAIRMAN said it was now his pleasing duty to ask the meeting to thank Mr. Parkes for his paper, practically illustrated as it had been by the observations of Mr. Rowland. He should perhaps have objected somewhat to this paper in its present form being read, had he not known that it would be supported as it had been, as a matter of principle, by Mr. Rowland, whose views were entitled to so much weight. So far as his own individual opinion went, he thought it desirable that papers read before a Society like this should not have for their object merely the description of some particular invention, but should be more general in their character. No one, however, could question the importance of a discovery which introduced a material likely to be of great value in the arts and manufactures of the country, and the want of which was becoming more and more felt. We were exhausting the supplies of india rubber and gutta percha, the demand for which was unlimited, but the supply not so. In the case of gutta percha the tree was destroyed in taking the produce of it, and we had to wait till other trees grew for future supply; and with regard to india rubber, the plants only produced a limited quantity each year. This new commodity, however, was produced from materials of which there was an unlimited supply, and as such its application to the purposes of electric telegraphy would be a matter of the highest interest and importance. Here he would make an observation in reply to the joke on the subject of patents, made by his friend, Dr. Bachhoffner, who was an advocate of one principle, while he (the chairman) supported the contrary view. That gentleman had taken the opportunity of assuming that he (the chairman) could not object to the inventor of this material having patented it, and deriving benefit from that patent. Certainly he did not object to his being benefited by the result of his labours through the means of a patent; for so long as the patent laws existed they were open to all; and he himself, though he thought on the whole they were injurious to the country, would not hesitate to benefit by them so long as these laws remained in force. But the argument of Dr. Bachhoffner was in reality in his favour. He objected to the name of parkesine being applied to the material, because there might be many "Parkes's." That was in fact the great objection to the whole principle of the Patent Laws

In this country there was scarcely a process or invention, or a new application of science to the arts, that hundreds of persons were not engaged on at the same moment of time. It was only a question which would be first to go to the patent office and secure the benefits of that which was occupying the time of a hundred other persons, whose results would have appeared in due course if a patent had not been secured by one, who thus impeded the labours of the others. The result was to give a monopoly to one person in a matter which ought to be shared in by many. As the law now stood, it was not the man whose ability and scientific knowledge brought about a great invention who got the benefit of it, but it was the most active and energetic man of business, who, simply by being the first to secure the patent, derived all the advantages. It was clear, if they looked at the specimens on the table, that this material was applicable to a vast variety of uses, from a shoe-sole to articles of ornamental art, and he was sure the meeting would unanimously agree that Mr. Parkes was entitled to the thanks of the Society for the very interesting subject he had brought before them this evening.

The vote of thanks was then passed and duly acknowledged.

INTERNATIONAL HORTICULTURAL EXHIBITION AND BOTANICAL CONGRESS, 1866.

This exhibition and congress will take place in London (probably in the Garden of the Royal Horticultural Society, at South Kensington), and will be open four days, from May 22nd to May 25th, 1866. The leading botanists and horticulturists throughout Europe have been invited, and two morning meetings (of the nature of a congress) will be held, at which papers prepared by leading botanists or horticulturists will be read and discussion thereon invited.

There will be two conversazioni and a banquet, to which leading foreign visitors will be invited as guests, and to which also ladies subscribing will be admitted. (Tickets three guineas each.)

The committee will endeavour to arrange that the most easily accessible English gardens, in which some feature of British gardening—such as "forcing," "decorative gardening," &c.—is well illustrated, shall be open to foreign visitors.

A subscription list has been opened for obtaining the funds necessary to the formation of a liberal prize-list (the prizes offered amount to over £2,500), the erection or part erection of the necessary exhibition building, the entertainment of foreign visitors, and for the working expenses of the exhibition and congress; a guarantee fund has also been opened.

The prizes are to be alike open to competition amongst home and foreign cultivators. The objects exhibited in one class cannot compete in any other. Prices may be affixed to the plants and other objects exhibited.

Every exhibitor must be prepared to declare that the objects he exhibits are his own property, or that of his employer. Those persons who intend to take part in the exhibition must signify their intention to do so by letter, addressed to the exhibition secretary. Every exhibitor must specify exactly the classes in which he intends to compete, and the space (in square feet) his exhibitions will occupy. This must be done on printed forms, which will be sent on application, and must be returned on or before the 1st of May.

A sub-committee will undertake the duty of receiving all objects presented for exhibition, and of distributing them according to the degree of temperature they require. Tropical plants will be placed in a building suitably heated.

The executive committee will endeavour to make arrangements with the several railway and steamboat companies to convey all objects for the exhibition at a reduced rate, and all packages must be delivered carriage paid.

A jury of distinguished horticulturists will be constituted to judge the objects sent for competition, and will assemble on the morning of Tuesday, the 22nd of May. Its decisions will be absolute.

The rewards will consist of money prizes only. One prize only can be taken by one exhibitor in each class, except amongst new plants and seedlings.

The opening of the exhibition will take place at three o'clock in the afternoon of Tuesday, the 22nd of May, when subscribers' and guarantors' tickets only, besides those of such persons as may be specially invited, or furnished with guinea tickets, will be admitted. Subscribers and guarantors will have certain privileges depending on the amount of their subscriptions.

The schedule of prizes comprises (1) General Collections, in which prizes for no less than twenty-six classes of objects (three prizes for each, of various amounts) are offered; (2) "Collections representing Families;" (3) "Collections representing Genera;" (4) "Collections representing Species and Varieties;" (5) "Seedlings;" (6) "Fruit," which must be exhibited ripe and fit for use; (7) "Vegetables;" (8) "Bouquets and Objects of Ornament in Natural Flowers;" (9) "Implements, Designs, &c.;" and (10) "Extraordinary Prizes."

In Class IX. (Implements, &c.) the Council of the Society of Arts have decided to offer the sum of £50 in prizes as follows:—

1. Half-size model showing the best principle of construction for a tent, for horticultural exhibitions, capable of being extended by a multiplication of the parts exhibited.....	£10	0	0
2. The best transplanting machine for weights of 8 tons and upwards	10	0	0
3. do. do. for half-ton weights	5	0	0
4. The best method of ventilating plant structures, to be shown by a model.....	5	0	0
5. The best garden wheelbarrow in principle of construction	3	0	0
6. The best sun shade for garden seats	3	0	0
7. The best guard for protecting young trees from animals in parks, orchards, and pleasure grounds	3	0	0
8. The best instrument for working to levels and slopes in garden ground work	2	0	0
9. Earthenware boxes for edgings capable of producing any length of straight and curved lines for borders in conservatories	3	0	0
10. Ornamental flower pots of large dimensions of common red clay for specimen plants, and for terraces, three prizes.....£3, £2, and	1	0	0

THE VIENNA INDUSTRIAL EXHIBITION OF 1865.

In a recent number of the *Journal** an account of the getting up of this Exhibition was given. The following is a statement of the opening and the results. The Exhibition was opened on the 17th of August last, by his Excellency Count Chorinsky. He was received by the members of the committee at the entrance, and, attended by them, proceeded to the great Hall. On his arrival, the choir of the printers' and the workman's musical societies sang the "Eichenkranz," and the band of the "Turners," or gymnastic association, played the "People's Hymn." Dr. Karl Helm then addressed the meeting, and thanked his excellency in the name of the committee for his kindness in presiding at the opening, and spoke at some length upon the utility of working classes industrial exhibitions. His excellency replied that the committee ought rather to be thanked for the labour they had taken in establishing and introducing such exhibitions into Austria. Herr Nikola said that as yet, and considering that only two months had elapsed

* Vol. xiii., p. 745.

between the issuing of the programmes and the opening day, the results had been most satisfactory. He thanked the various societies, the Imperial Royal Horticultural Society, and the Press, for all the assistance and support they had given the committee. After this his Excellency, accompanied by Herren Nikola and Helm, inspected the Exhibition. During the morning the band of the "Turners" played various selections. The number of articles exhibited was 1,025, divided as follows:—

	Articles.
Classes I. & II.—Objects of art, and professional art work	90
Class III.—Trade productions	334
Class IV.—Female handwork	25
Class V.—Amateur work	81
Class VI.—Mechanical and other articles of new invention	71
Class VII.—Miscellaneous	424
Total	1,025

The following juries were appointed:—For female hand-work, art and art workmanship, bookbinding, fancy work, engraving, shoemaking by hand, instrument making, tailoring, mechanical workmanship, steel workmanship, carpentering, workmanship in silver and metal, hair work, shoemaking, watch making, weaving.

The awards were as follows:—18 gold medals, 158 silver medals, 227 bronze medals, 210 honourable mentions; in all 613.

The Exhibition closed on the 1st of October, and the gold and silver medals were distributed by his Excellency Count Chorinsky, and the bronze medals and honourable mentions by Herren Lobmeyer and Ackermann on the same day. A deputation of the exhibitors waited upon the committee and thanked them in the name of the exhibitors. A concert and an improvised ball closed the proceedings. Besides this, all the prize-holders were invited by the committee of the Linz Exhibition to exhibit their articles at Linz, and the committee undertook to convey the articles to and from Linz free of cost. The number of visitors during the Exhibition was 51,410.

The account of the receipts and expenditure stand as follows:—

Receipts:—	fl.	kr.
Donations to the Prize Fund	917	3
Admissions	5,197	80
Entrance fees	13	8
	6,127	91
Expenditure	4,028	47
Showing a surplus of	2,099	44

Or about £175 sterling. And this surplus was handed over by the committee to various charitable institutions of Vienna.

OBSERVATIONS FOR CONSIDERATION PREVIOUSLY TO THE LAYING OF ANOTHER ATLANTIC CABLE.

BY T. SEYMOUR BURT, ESQ., F.R.S.

The first Atlantic telegraph cable was actually laid between the shores of Ireland and America, in the year 1858; and by what means was it so efficiently laid without on any occasion, if I err not, its breaking or separating throughout any portion of its length, so as thereby to require the difficult, if not fatal, operation of hauling it in again to cut out the faulty part, and to effect its repair? How was it laid?—Why by making use of two ships instead of one, viz., the English *Agamemnon* and the American *Niagara*, which ships, each conveying out half the cable, having joined the ends of the same, and spliced them in central Atlantic ocean, steered away for their respective countries, which they satisfactorily, if not simultaneously reached, after having deposited these two halves of the cable in the bed of the sea, as well as having connected the other two ends with the ends of the coils proceeding from the two opposite shores. Well, this fact shows the possibility, or rather the practicability, of laying a cable between this country and America or Newfoundland. Then why has the operation not succeeded in the second instance?—Simply, because one ship only has been employed in the performance in the latter instance, instead of two ships. For, if two ships managed so well to lay a long cable in the first instance, why should only one ship have been employed on a second operation, and one, indeed, which has so specially failed? As time represents nearly everything with respect to the chances of storms occurring to disturb the equable paying out of the cable, it is manifest that if only one ship be employed in the operation instead of two, there must be four chances to one against the one ship escaping a storm in double the time, to that of the two ships escaping a similar calamity or inconvenience in half the time, as required for the voyage; besides, the two ships, before parting in mid-ocean, on depositing their joined ends of the cable in deepest water, being nearer one another can help one another in the most difficult portion of their course, or that where—if the cable should break at or over the central (or assumed) deepest part of the ocean—they would both remain, or, separating, would return to meet again, and so constantly to assist each other in recovering the escaped end of the coil. Whereas the one ship alone has no help at hand but its own. I should be disposed, therefore, to advocate the use of two such ships again, instead of one, in the operation of relaying the Atlantic cable.

But there is another argument against the use of one ship only. That ship must, like the *Great Eastern*, necessarily be of immense size, in order to be sufficiently capacious to contain, or stow away, the whole main length of cable, which consists of some 1,900 or 2,000 miles or more. Now, the greater the size of the ship the greater the stress exerted upon the cable when she raises her bow above the surface of the water—like as a giant pulls more strongly than a child. A smaller ship's haul or strain exerted upon the overhanging cable would not so tend to rend that cable (notwithstanding its tendency to rise to the wave to a greater height than the bow of the larger ship) as would the terrible dead weight and rise or stress or strain of the huge ship itself, the resistance of the cable being unnecessarily overpowered by the superior *momentum* of the latter vessel, and being thereby caused to be rent in twain, from the effect of the increased tension, which serves to break it like a piece of thread. And therefore, probably, if a very small ship or steamer could be steered in advance of the *Great Eastern*, on her next attempt, and could then be made to receive the descending part of the cable after it has left the latter ship, and, next, to deposit it directly over its own bow into the deep, the cable would be less liable to be torn asunder than if the big ship should pay it out alone and at once over its own bow directly into the abyss.

But why did the cable which had been first laid fail? A reply to this momentous question is printed in Part I., Vol. III., of my Miscellaneous Papers on Scientific Subjects, London, 1861, pp. 32-8, in a letter addressed to the late Viscount Palmerston, whilst Prime Minister, dated July 23, 1860.

I repeat the question. Why did the first laid cable fail, after having been properly laid from end to end? It failed simply because one-half of the length had been twisted (in manufacture) to the right hand of the line of its axis, whilst the other half had been twisted to the left hand of the same line or axis. How was this done? One of the halves had been manufactured on the banks of the Thames, the other half in another locality, the name of which I forget. Yet, strange to say, this fatal

defect was considered, it appears by the *Times* of the 13th of May, 1858, to have been remedied or "overcome" by joining the two ends, in midway Atlantic, to certain "rods of iron, loaded with a weight in the centre," which it was hoped—for it could not have been believed—would rectify the fault. And so the cable failed—as every mechanician ought to have known it would fail—and yet not even a trial beforehand was made of the two pieces—pieces contrarily twisted, be it remarked, and known to be so—by joining them together, I mean the half cable twisted to the right hand and the other half twisted to the left, in order to ascertain the effect of a heavy strain exerted upon those two halves when so joined. The consequence was that the so-joined coils, each consisting of one-half the whole cable, soon began to unwind and gradually to untwist themselves, until the electric pulses or pulsations, passing through the gradually attenuated core or copper wire, upon which the entire strain or stress was now thrown, became weaker and weaker, until they shortly afterwards, like my Uncle Toby's pulse in "Tristram Shandy," fluttered, stopped, beat again, and then entirely ceased! Nor was this effect to have been wondered at. Let any person of average common sense try the effect himself with two sets of small wires (or threads), three or four threads in each wire; one set twisted to the right hand the other set to the left hand of the axis of each coil, and then let him, after having joined one end of one coil to one end of the other by a firm knot, or even a "curved bar of iron," and after having stretched the whole coil in a straight line, with a stress bearing upon it, state from his own experiment, proof, and experience, what he considers to have been the main, if not sole, cause of failure of the first laid Atlantic Telegraph Cable.

It matters not with a cable manufactured in but one direction, *i.e.*, with the helix to the right or with the helix to the left, whether it be cut and then joined again either at the surface of separation, or at the opposite ends, or with the cut end of one portion joined on to the worn end, or to the furthermost end of the other portion, because the helix or twist would remain the same in any mode of junction throughout the entire line; but, I maintain that if any one portion of the one half be of a different twist to any portion of the other half, both portions of the coil situated near the point, or rather, surface of junction, will, on tension being applied, immediately begin to unwind themselves; and thus will transfer the tension they are intended to resist from themselves to the central copper wire they are intended to support, which latter will consequently become so attenuated from that powerful cause, as at least to separate itself into two detached parts, besides being more or less laid bare by the opening up (or out) of the outer helix, consisting of coils of wire and other substances placed for its protection. Let any one try the effect of the experiment, as I said before, and the result must confirm the entire correctness of this assertion. Therefore, I assume it to be absolutely necessary, in order to avoid certain failure, that all parts of the cable, shore-ends as well as others, should be manufactured of one uniform helix or coil.

The point now, however, for consideration is, how to lay the cable again after the occurrence of two not altogether unexpected failures? or, rather, how to lay a new cable, and that, if possible, without having to "haul in" again any portion of it after it has been "paid out," in order to discover the whereabouts of its faulty insulation, and with a certainty of weakening the chain or cable on every occasion that it is cut and again spliced. Now, this difficulty may be partially obviated by not having so very many splicing places in the original cable; for it must be evident that the greater the number of splicings or junctions in the same the less the chances of its efficiency. The parts "spliced" together cannot possibly be so strong or so closely connected, or the central wire (the vehicle of the electric message) so intimately adhesive in all its fibres, as the one originally manufactured in its integrity. What a large number of splicings or junctions there must have been in the late Atlantic cable; first, there was the batch of splicings required to join each of the several lengths sent down at different periods from Messrs. Glass and Elliott's workshops by each vessel that shipped a length to convey and join it on to its predecessor on board the Great Eastern. Then a splicing was required for each of the tanks when filled, or at any rate for two out of the three tanks in which the cable was stowed on board the leviathan ship. Next, the "splicing the main-brace" to the end at the Irish shore, and "yet another" splice would have been required at the junction with the land side on the American shore. "I'll see no more," as Macbeth says, almost dreading this long account of splicings in the late cable, and trusting it may be possible to avoid some of them in the new one. The first-laid cable was not so cut and so joined, it is to be presumed, as the second one, and yet the former was undoubtedly laid the whole distance, and for the moment successfully so—a message having been transmitted from end to end—from America to England, and this without the occurrence, that I am aware, of any breakage or separation of the coil (save one), in consequence of a mishap. How was this done? By the employment of *two* ships. And would not the cable have continued its insulation for a reasonable time—not expecting, of course, that it would have solved the problem of perpetual motion—had not its two halves been coiled, unfortunately in two contrary directions; and had they not still more unfortunately been joined together with that sad and fatal fault existing, although the fact was known at the time, or beforehand, certainly before the 13th of May, 1858, without a trial being made to ascertain whether the cable would, when so joined, succeed or not, and when such a trial would have caused but a few hours delay in the commencement of so great and glorious an undertaking.

In recommending, as I have done above, that two ships should be employed in the performance of this great work instead of one, I do not mean to infer that the operation cannot be completed by the Great Eastern herself, providing a smaller accompanying vessel can be steered but a little way ahead of her, for the reception of the descending cable as it descends from her bow, and before it is allowed to enter into the deep sea, as before explained. I would only desire to be understood as generally advocating the use of two ships instead of one in the execution of this vast undertaking, in the completion of which we all as Englishmen must feel so deep an interest.

One great means of control, however, should exist in the paying-out apparatus, which should be made by means of springs and wheels, or other self-adjusting arrangements, to apportion, at the required velocity, a sudden supply of slack cable, whenever a great and sudden rise of the ship's bow happens to take place, and to require the said supply as from a feeder, so that the amount of strain upon the cable should, if possible, be neither more nor less than a constant quantity. Upon this most important arrangement a great deal of the success of the work must necessarily depend; whereas a different principle will involve but little chance of such a desideratum.

Fine Arts.

ART EXHIBITIONS IN FRANCE.—The system of exhibitions of works of both pure and applied art is spreading itself rapidly over the whole of France; in addition to the number of annual exhibitions which take place in the chief towns of so many of the departments, and which have been noticed in the *Journal*, new ones are springing up, under the auspices of societies formed for the encouragement of art in various localities,

and, in some cases, where such an attempt would scarcely be looked for. Amongst others, an exhibition of works of art of all kinds is announced to open at Pau, in the Pyrenees, on the sixteenth of January next, and to remain open till the fifteenth of March. A society has just been formed at Orleans, where in future there will be annual exhibitions of works of art. The *Moniteur des Arts*, of Paris, says that the action of the society, and consequently the scope of the exhibitions, will not be confined to painting, sculpture, drawing, and engraving, and quotes the following passage from the programme of the new society:—"The fact is recognised now that purity of line, harmony of colours, fitness of design and richness of composition, are the true characteristics of art, and such as inventive imagination can apply to objects of common utility as well as to the canvas on an easel, and that the useful does not exclude the beautiful." The object of the society is the encouragement and exhibition of art in all its forms, but apparently only in relation to the department in which it is situated and the surrounding departments; it is not the intention of the society, for the present at any rate, to invite the artists and art workmen of Paris and other places in France to exhibit at Orleans. Another large and important town, that of Lille, is about to establish an annual exhibition of the fine arts; there has not been anything of the kind at Lille for many years.

Artistic Metal Work in France.—The manufacturers and art workmen of Paris engaged in the production of works in bronze, cast iron, zinc, and silver, have a co-operative association, and by means of their own subscriptions, and those of the friends of art, who join the society as honorary members, are enabled not only to give a number of prizes, but also to aid their aged and invalided brethren. This society has just had an exhibition of the productions of its members, for which space was granted by the directors of the Conservatoire des Arts et Metiers; twenty prizes, and as many honourable mentions, with medals, were awarded for modelling, chasing, ornamentation, drawing, founding in bronze and iron, turning, and mounting. This association also appoints delegates who act as arbiters in cases of disputed copyright in works of industrial art. M. Crozatier, a well-known bronzist, has left, by will, a considerable sum of money for the foundation of an annual prize, to be given to the most distinguished working chaser in metals. The first competition for this prize is about to take place, the pieces being received at the Hôtel de Ville up to the twentieth of the current month of December.

Commerce.

Sugar.—Alvaro Reynoso's Cold Process.—Messrs. Travers call attention to this process as follows:—"Certainly no one can say that sugar manufacture is not advancing, when we have to chronicle in one year, Fryer's Concretor, the Alcoholic Process (of which we hope to give details shortly), and the Cold Process of M. Reynoso. True, neither of these inventions have as yet had any effect upon sugar-making in general, but they have also not been tried. Without them, however, a point has been reached, when, with vacuum pans, centrifugal machines, *appareils à triple effet*, and other old inventions and new applications, white sugar can be as cheaply made as brown, and when, were it not for the scale of duties, we should receive all our sugar in a fit state for immediate use. With regard to M. Reynoso's process, the following particulars are extracted from a paper read by that gentleman before the French *Académie des Sciences*, and reported in the *Comptes Rendus* of that body. M. A. Reynoso commences by saying:—'The process for the treatment of saccharine juices, which I have the honour to submit to the Académie is divided into two parts. 1st. Defecation. Chemists have long been occupied with the advantages that would result were aluminous substances used in sugar manufactures. Alum, sulphate of alumina, and alumina itself, in a more or less pure state, have been tried with more or less success in sugar manufactories. Evans has described in detail the way in which alum and the sulphate of alumina were used, and speaks of the good results that had been obtained in the English colonies. I myself have employed sulphate of alumina under different circumstances, but have seen that, side by side with considerable advantages, the use of this substance leads to serious inconveniences. Acid phosphate of lime has been used in Cuba since 1860, and particularly in 1863, in M. D'Aldama's works, by Mr. Swift, a distinguished American refiner, and I about that time described his process. I believe that I can now use alumina in a way to produce a defecation, perfect from a commercial point of view, and that I at the same time succeed in eliminating hurtful substances. The substance I use is acid phosphate of alumina. After having put it directly into the cane juice, the mixture is treated with lime; free alumina and phosphate of lime are thus formed. The reactions resulting from acid phosphate of alumina, from alumina, from phosphate of lime, and from lime added in slight excess, do away with the colouring matters, azotized bodies, &c., in such a way that only a few of the salts are left that originally existed in the juice. This defecation may be compared to that produced by sub-acetate of lead, but it has not its inconveniences. 2ndly. Separation of the Water. To evaporate the water contained in the purified juice, I employ *cold instead of heat*. I prevent in this way the numerous and complex reactions which, under the simultaneous influence of air and water, and heat coming between the different matters of which the juice is formed, cause the change in the colour of the sugar. By means of a rapid cooling, produced in suitable machines, I change the juice into a Magma—formed of a mixture of water reduced to the state of small pieces of ice, and of a syrup more or less dense, according to the conditions of the operation. To separate this mixture I have recourse to centrifugal machines, and I end the process by evaporating the syrup in vacuo. The details of the process will be found in my memoir.' This memoir has not yet been made public, and we shall await further particulars with some impatience. To give an opinion as to the value of the chemical part of the defecation, would be premature, and it is only in practice that its value can be determined. With regard to the separation of the greater part of the water by freezing, the idea is so simple, and yet so beautiful, that it cannot but excite admiration. It is well known that water when frozen rejects almost all alien substances, and that the ice even of a muddy puddle is pure, while the salt is driven out of frozen sea water. Whether the cold process will pay we cannot say, but M. Reynoso deserves every credit for the application of a well-known principle to sugar-making, and we may conclude by wishing that gentleman the success to which his efforts entitle him."

Relative Value of Manure.—It appears that this subject has been recently discussed in some of the West Indian journals, and is exciting a considerable degree of interest in these islands, especially among sugar-growers. The discussion originated with a letter, which appeared in the columns of the *West Indian*, a Barbadoes paper, calling attention to the results of some experiments by M. Ville, a Professor of Vegetable Physiology at Rouen, who, after a series of experiments, extending over fifteen years, comes to the conclusion that there are four, and only four, elements which perform an important part in promoting the growth of vegetable productions; that these are lime, potass, phosphate of lime, and nitrogenous substances; and that the combination of these four constitutes a perfect manure; but, though the presence of all four of these constituents is necessary for the improvement of a soil which shall be capable of producing all the various forms of vegetable life, among these four agencies there is

stated to be for each peculiar crop a dominant element, thus:—for wheat and beet-roots, nitrogenous matter would be most required; for vegetables, potass; and so on. In the soil—the marls, the chalk, the megass ash of Barbadoes, they can obtain at once lime, phosphate, and potass, whilst Peruvian guano would supply them with the remaining element—nitrogenous matter. What the probable result of such an application of manure would be, may be inferred from the continually increasing prosperity of Mauritius. In that island the sugar returns have, of late years, increased to an enormous exent, though not a single additional acre has been brought into cultivation.

RICE IN ITALY.—Mr. Sackville West, in his "Commercial Report on Italy for the year 1863," says that rice is more extensively cultivated in Italy than in any other part of Europe, although the date of its introduction in comparatively recent. Its cultivation, for sanitary reasons, has always been more or less restricted by legislative measures, and the question as to whether it is really pernicious or not to the health of the surrounding populations has ever been and still is seriously discussed. The rice which is grown in Italy must be cultivated under a system of irrigation. There does not appear to be sufficient humidity in the air to admit of the successful cultivation of the species "mountain rice" (riso di montagna) which was brought by M. Poivre from Cochin China to the Mauritius, from whence it was subsequently brought to Europe, where it is proved to have germinated and come to maturity in climates possessing the requisite amount of humidity. Neither the Greeks nor Romans appear to have cultivated rice, although it is certain they knew of such produce as coming from Asia by the Red Sea to the ports of the Mediterranean. The Arabs are supposed to have cultivated it, and to have introduced it into Egypt and the southern parts of Europe with which they came into contact, but nothing is certain as to its existence in Europe until its introduction into Spain by the Moors in 1324, although a certain Peter Crescentius mentions it as growing in the marshy lands about Bologna as early as 1301. There are legislative enactments extant of Francesco Sforza and Ludovico the Moor, which prove that it was cultivated to a considerable extent in the Milanese in the fifteenth century. In the year 1585, the Spanish Governor of Milan, the Marquis Aymonte, prohibited it as a pestiferous production. Notwithstanding, however, all efforts to restrict its extension, it continued to spread throughout Italy, especially on the coasts of the Adriatic about Venice and Ancona in the valley of the Po. In Spain and Portugal sufficient care and attention were not bestowed on its cultivation as to render the crop important. It was grown to some extent in some parts of France until Cardinal Fleury put a stop to its cultivation, and at the present time it is by no means a profitable speculation. In Italy, however, the contrary is the case, and the crop is most remunerative, but it is a matter of serious consideration for the Government to decide the question as to its pernicious effect on the health of the population, and if necessary, to adopt the most judicious measures to prevent the evil consequences consequent on an undue extension of its cultivation near great towns.

Colonies.

PROGRESS IN NEW ZEALAND—The principal street in Hokitika is Revell-street, nearly half a mile long, containing 246 buildings, substantial and commodious business places. There are 55 stores, consisting of wholesale merchants, drapers, ironmongers, commission and shipping agents, grocers, fruiterers, &c., each and all apparently doing a thriving business. There are eight butchers in this street, nine shoemakers, six blacksmiths, four restaurants, three chemists, three banks, &c., &c. There are also two saddlers, two doctors, two barristers, four stationers, three jewellers, two auctioneers, and one printing office. The hospital is the only public building in Hokitika.

NORTH AUSTRALIA.—Mr. A. C. Gregory, the explorer, speaks in very high terms of this country. Estimating the progress of settlement at its present rate, it is anticipated that in about three years a cordon of stations from the Albert to Adam's Bay will be occupied. The rate of progress will depend greatly upon the success of the settlements established by the South Australian Government at Adam's Bay, or at any spot to which the settlers may remove. The country generally is well watered—water, in fact, is very abundant around the gulf and the Victoria, excepting the upper part of Arntreim's Land. As soon as the stations on the gulf are sufficiently established stock will be able to be driven from the southern districts of Queensland to the north-western coast, making the gulf a stepping-stone between the two. It would take two years to start from Darling Downs with stock to reach the Victoria River, because the seasons follow in such a way that certain portions of the country would only be practicable at different periods.

SUGAR-GROWING IN QUEENSLAND.—The cane planted in August and September is reported to be above ground from six to twelve inches, and with the warm dewy nights will make rapid progress. The ratoon crops show ten to twenty vigorous shoots per stalk. From the north reports are all favourable. Clearing, stumping, and ploughing are being carried on with great energy. Extensive operations are going forward at the Cabulture Sugar Company's estate, and before the season for planting is closed it is believed that 200 acres will be ready for the reception of the plant. The difficulty, both north and south this season, has been the procuring of plants.

TRADE OF ADELAIDE.—The declared value of imports and exports at Port Adelaide, during the present year, up to August, was as follows:—Imports, £1,672,560; exports, £1,429,529. A comparative statement of the imports and exports of Port Adelaide during the first thirty-three weeks of 1864, shows that the imports were then £1,400,173; the exports, £1,661,915; thus, in the present year, there is an increase in the imports of £272,387, but a decrease of £232,380 in the exports. The sales of crown lands from the commencement of 1865 to August 24, were as follows:—

Public auction,	179,426 acres,	realising	£303,764
Private sales ..	27,477 „	„	28,769
	206,903		£332,533

During the corresponding period of the years 1859 to 1864, inclusive, the sales have averaged 76,260 acres, realising £100,795.

PUBLIC WORKS IN NEW SOUTH WALES.—The moderate sum voted last session for the construction of public works appears to have been nearly all expended. Scarcely any sum was voted for new works, so much as for the maintenance of roads, railroads, the completion of jetties, wharves, and public buildings already in hand. The various railway extensions are progressing very slowly. In Bathurst a Railway Extension Association has been formed, and meetings are being held for the purpose of influencing the Government to push on the railway extension to the western districts more rapidly. In the southern districts an Association has also been formed at Braidwood for the purpose of inducing the Government to form a branch line to connect Braidwood with Goulburn.

Publications Issued.

CHEMISTRY FOR STUDENTS. By Dr. A. Williamson, F.R.S., F.C.S., &c., Professor of Chemistry at University College, London. (*MacMillan and Co.*)—This is one of a series of educational works emanating from the

Clarendon Press, Oxford. The object of this book is to afford students in chemistry an insight into the most interesting and useful facts in that science, and to supply an outline of the most important ideas which may be obtained from a study of such facts. The method of exposition differs from that which is adopted in most other treatises of chemistry. The author describes and compares individual facts so as to lead the mind of the reader towards general principles, instead of stating the general principles first and then proceeding to illustrate them by details. This book is intended for the use of beginners, and also of such students who, having made some progress in the science, may wish to have an outline of the chief facts and theories of mineral and inorganic chemistry. A series of questions are appended to the first few chapters, and students would do well to work out the answers to them, and thus practise themselves in using the elementary facts of chemistry. The author proposes to publish shortly answers to these questions.

DRAWING FROM NATURE. By George Blanchard. (*Longmans.*)—This work consists of a series of progressive instructions in sketching, from elementary studies to finished views, with examples from Switzerland and the Pyrenees. To this are added lectures on art delivered at Rugby School. The whole is illustrated by sixteen coloured and lithographic plates, and more than a hundred woodcuts. The author, who is Professor of Drawing at Rugby School, prefaces his introduction with the following words of Lord Brougham:—"Drawing is of the greatest use in after life, and above all it has the effect of leading to accurate habits of observation, and a more distinct knowledge and mechanical facility than almost any other kind of manipulation; it is a sovereign remedy for correcting idle habits, and of the greatest benefit to the scholar—it is a most admirable adjunct to education."

Notes.

FUNERAL OF THE LATE CAPTAIN FOWKE, R.E.—In addition to the names already published, we are informed that Mr. Hope, the President of the Royal Institute of British Architects, Mr. Tite, M.P., Mr. Donaldson, Mr. Gilbert Scott, R.A., Lord Henry Lennox, M.P., Mr. Charles Manby, Mr. J. Clutton, &c., had written to express regret at their unavoidable absence.

FEMALE EDUCATION IN FRANCE.—A young lady, twenty years of age, daughter of a naval officer, has just received the degree of Bachelor of Letters, at Montpellier, having passed through the competitive examination with great distinction. Mdlle. Antonia Cellarier took the first place in translation from the Latin, and the fourth for Latin composition, with nineteen competitors. Montpellier is the fourth town in the empire that has conferred the degree of Bachelor on a female pupil, the other three being Lyons, Bordeaux, and Algiers.

CONTINENTAL TELEGRAPHIC CONVENTION.—An Imperial decree has just been published in Paris promulgating a convention, concluded in May last, between France on the one part, and Belgium, Austria, Baden, Denmark, Spain, Greece, the City of Hamburg, Italy, Holland, Portugal, Prussia, Russia, Saxony, Sweden and Norway, Switzerland, Turkey, and Wurtemburg on the other, and which has for its object the organization of the entire telegraph system and the establishment of a fixed international tariff. The dispatches are classed under three heads, those of the state, or governmental dispatches, those connected with the public service, and, lastly, private telegrams. The tariffs will fix the amounts to be received by each country as regards transmission, receipt, and transit. The ratifications have been exchanged between all the powers, with the exception of Greece, Portugal, and Turkey, in which there has been some delay, and the convention is to come into operation on the first day of the coming year. This arrangement will be of essential service to the commercial world by doing away with inconsistencies, and setting up a regular and fixed scale of charges.

THE POPULARISATION OF ART IN BELGIUM.—M. Hendrickz, a Belgian painter and inspector of the drawing classes in the communal schools of Brussels, has been for some time in Paris making experiments, under the direction of the Minister of Public Instruction, in teaching working men, utterly ignorant of art, to draw, after a method of his own, which has proved highly successful in Belgium. A class of fifty adults was formed in August last, at the Lycée Bonaparte; the pupils included young men studying under the Polytechnic Institution, clerks, engineers, and fitters employed by the Western Railway Company, and other workmen. One only of these had any notion of drawing, yet, after twenty-two lessons of one hour each, it is reported that all were able to execute complicated drawings with firmness and taste. The Minister has decided that the experiments shall be continued at the Lycée Charlemagne, by M. Bourson, another artist, and colleague of M. Hendrickz; the course is to be divided into two classes of thirty-five pupils each, one for the elementary stage, and the other for more advanced pupils. Other courses are to be opened by the same teacher, at the primary normal school of Versailles, one for the pupil teachers and the other for the youths in the school.

SPONGES.—Mr. Newton's *Travels and Discoveries in the Levant* contains the following in reference to the sponge divers of the Isle of Calymnos, who sail in a fleet of caiques for the coast of Asia Minor and Syria during May, and fish up annually £16,000 worth of sponge:—"The diver descends, holding a flat stone in both hands, to assist him in sinking, on which stone a cord is fastened. When he gets to the bottom he puts this flat stone under his arm and walks about in search of sponges, putting them in a net hung round his neck as fast as he uproots them; he then pulls the cord as a signal, and is drawn up again. It is said that the best divers can descend to a depth of 30 fathoms, and that they can remain under water for as long a period as three minutes. From inquiries which I have made, it does not appear that they are often cut off by sharks, though these monsters are not unfrequent in the southern part of the Archipelago. It is possible that the rapid descent of the diver may scare away this fish, who generally seizes his prey on the surface. A Calymniote told me that the most terrible sensation he had ever experienced was finding himself close to an immense fish at the bottom of the sea. Under the root of the sponge is a parasitical substance of a caustic nature. This often bursts when the sponge is suspended round the diver's neck, and the liquid it contains causes deep ulcers in his flesh." Before exportation the sponges are cleansed and spread out in fields to dry. Acres of them may thus be seen exposed in fine weather. Sponges are sold by weight, and formerly the weight used to be increased by introducing a little sand. To prevent this fraud, the merchants insist upon their being filled with as much sand as they can hold, and as this amount can be accurately calculated, it is deducted from the gross weight. Hence arises the deposit of sand which a new sponge leaves at the bottom of the basin.

Correspondence.

THE LATE CAPTAIN FOWKE, R.E.—Sir,—As the writer of some of the notices in "the architectural press," of the designs for the Natural History Museum buildings, proposed in 1864 to be erected at South Kensington, I beg to contradict the assertion which Mr. Cole is reported to have made at the meeting of the Society of Arts, on December 6th, that "the architectural press" had "fully confirmed the decision" of the judges; and I shall feel obliged by your reading the contradiction at the meeting

this evening of your society, and by your inserting it in the next number of your *Journal*. On reference to the leading article of the *Builder* of April 23rd, 1864, it will be observed that no design was indicated as deserving of selection; but that the conspicuous position in the Exhibition, and the execution and mounting of the drawings afterwards found to be Captain Fowke's, were referred to; whilst the arrangement of the plan and the manner of lighting, were alluded to as possibly defective. Moreover, in the following number of the same journal, hope was expressed that a rumour of some decision having been arrived at was incorrect. On this latter occasion the improbability that there could then have been a decision of any value was pointed out; and again, on May 14th, the little value of the decision was made apparent, in remarks on the design to which was given the third premium,—a design which, though by an architect of great ability, was impracticable, as it was shown; and which the professional men of the judges, by their selection of it, appear to have failed to see was impracticable. As to the actual merit of Capt. Fowke's design compared with other designs, the question is one that I do not touch; and I have not a fragment of a desire to depreciate the abilities of Capt. Fowke—which were very great, and whose personal character seems to me to have deserved all that Mr. Cole would say in favour of it. But, deeply regretting his early removal, I feel that it is important to the issue of any future proceedings connected with public works and architectural art, to know that the judges in the case to which Mr. Cole referred (professional men though they were) did not, in the opinion of "the architectural press," decide the question submitted to them after such examination of the whole number of works that they were called upon to consider, as would have been necessary for acquaintance with the features of those schemes, and much less for a judgment upon them.—I am, &c.,

EDWARD HALL.

3, Adam-street, Adelphi, 20th Dec., 1865.

To Correspondents.

ERRATUM.—In last number, page 71, col. 2, line 16, for "lb." read "bl."—*i.e.*, for "pound," read "bushel."

MEETINGS FOR THE ENSUING WEEK.

TUES.... Royal Inst., 3. Prof. Tyndall, "On Sound." (Juvenile Lectures.)
THURS.. Royal Inst., 3. Prof. Tyndall, "On Sound." (Juvenile Lectures.)
SAT. ... Royal Inst., 3. Prof. Tyndall, "On Sound." (Juvenile Lectures.)

Patents.

From Commissioners of Patents Journal, December 15th.

GRANTS OF PROVISIONAL PROTECTION.

Animal and vegetable substances, preserving—2952—R. Jones.
Baths—3129—E. Headly.
Brushes—3060—J. Stokes and T. Gray.
Butter—2936—H. Clifton.
Cement—3119—R. A. Brooman.
Coal, &c., machinery for getting—3127—G. E. Donisthorpe.
Coffins, air-tight—3014—H. J. Cox and W. Loach.
Compasses—3083—I. J. Handley and C. Wilkins.
Disinfectants—3115—J. Tomlinson.
Doors, &c., knobs for—3061—J. Wilson.
Enamel, &c., composition for—3042—W. R. Lake.
Fibrous substances, cleaning—3137—G. Macdonald.
Fibrous substances, preparing—3123—I. Holden.
Fibrous substances, 'top rollers' used in making—3073—J. Kerfoot.
Fire-arms, breech-loading—3113—E. C. Hodges.
Floors and doors, preventing draughts between—3050—L. D. Carbonnier.
Forge furnaces—3109—W. Beardmore.
Furnaces—3095—E. B. Wilson.
Furnaces, combustion of fuel in—3062—T. Lancaster.
Furniture, a convertible piece of—3057—T. Laurie.
Gas fittings—3089—W. Johnston.
Head, coverings for the—3056—H. A. Bonneville.
Heavy bodies, moving—3093—T. A. Weston.
Illusory exhibitions, apparatus for—3139—J. H. Pepper & T. W. Tobin.
Insulators—3121—J. Prest, H. Harrison, and B. Roeber.
Iron and steel, casting—3018—J. Whitworth.
Iron, forging—3027—J. Arrowsmith.
Iron, treating the oxide of—3099—T. Bell.
Iron, wrought—3034—G. T. Bousfield.
Metal bedsteads—3135—H. B. Hamilton.
Metal tubes—3117—P. A. Muntz.
Motive power, obtaining—2080—W. T. Cole, H. S. Smith, and A. Soares.
Motive power, obtaining—3016—J. Wauthier.
Oils, distilling—3101—T. N. Bennie.
Paper—3041—W. E. Newton.
Pipe wrench, a combined adjustable spanner, tube cutter, and—3036—J. P. Baragwanath.
Rails, locomotive engine wheels adhering to the—2977—A. Vescovali.
Railway chairs—3131—J. Taylor.
Railways—3024—A. V. Newton.
Screw gill boxes—3038—W. Hodgson.
Sewing-machine needles—3143—N. Salamon and W. J. L. Davids.
Shaft shackles—3044—W. R. Lake.
Spirituous liquors—2962—P. J. Fallon.
Spirituous liquors, purifying—3071—W. Thompson.
Stables, &c., disinfecting—3075—J. Gamgee.
Stays, &c.—3049—E. Drucker.
Steam boilers—3141—W. E. Newton.
Steam boilers, water guages for—3026—J. Draper and W. Leech.
Steam cylinders, preventing the escape of heat from—3051—W. Simons and A. Brown.
Steam, registering the pressure of—3077—J. L. Norton & J. Landless.
Steel, &c., casting—3030—F. Trachsel and W. Hall.
Sugar—2606—J. A. Leon.
Textile fabrics, shrinking—3020—S. C. Salter.
Thrashing machines, beaters for—2992—W., E., and J. Gray.
Trunks or packages, shields for—3022—W. E. Newton.
Umbrellas and parasols, stretchers for—3097—R. Cook.
Weaving, heads for looms for—3028—R. T. Hothersall, S. Cook, and W. H. Hacking.
Weaving, looms for—3091—E. Scott.
Weaving, ornamental—3145—W. H. Clabburn.
Wood, cutting mouldings in—3040—W. E. Newton.
Woven fabrics, producing scarlet colours upon—3111—A. Paraf and R. S. Dale.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Steam boilers—3184—N. W. Wheeler.

PATENTS SEALED.

1637. W. Howes and W. Burley.
1652. W. E. Gedge.
1661. D. McGlashan.
1663. E. Dupont.
1666. W. E. Gedge.
1669. C. T. Porter.
1686. E. Finch.
1723. R. Boot and J. Coxon.
2088. H. R. Guy.
2119. J. B. Brown.

From Commissioners of Patents Journal, December 19th.

PATENTS SEALED.

1559. A. Barff and E. L. Sim.
1674. E. K. Dutton.
1691. R. A. Brooman.
1693. P. A. le C. de Fontainemoreau.
1694. F. G. David.
1696. C. R. Bamber.
1705. J. Whittle.
1712. J. Spratt.
1724. P. Jacovenco.
1808. J. Willis.
1898. J. H. Wray.
2429. H. A. Bonneville.
2432. W. Turner, S. Shore, and W. Halliwell.
2436. T. V. Lee.
2453. W. E. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

3394. I. Holden.
3395. I. Holden.
87. R. Luthy.
3331. C. Hancock & S. W. Silver.
3379. G. A. Huddart.
3397. W. S. Longridge.
3336. J. W. Baker.
3384. J. Clayton.
3404. A. T. Blakely.
3366. W. Tongue.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

39. J. Howard.
2876. J. Wardill.
2896. J. Kerr.
2900. J. MacKenzie.

Registered Designs.

The Shield Envelope—December 5—4755—W. H. Hook, 2, Hanley-street, Walworth.
Rotary Water Trough or Cistern for Stables and other purposes—December 9—4756—J. Barton, Oxford-street, W.
Safety Lever and Joint connected therewith for Stopping or Reversing the Motion of Chaff-cutting Machines—December 11—4757—C. W. Otway, Reading, Berks.
Collar Holder—December 13—4758—Messrs. Baldock and Denne, Phœnix Works, Cambridge-road, E.